12/31/10

MEMORANDUM FOR: Roger Lamoni
Fire Weather Program Manager
National Weather Service, Western Region

FROM: Andy Haner and Carl Cerniglia
Fire Weather Program Leaders
National Weather Service, Seattle, WA

SUBJECT: 2010 Annual Fire Weather Report

The following report is an evaluation of fire weather products and services provided by Seattle WFO to Western Washington land management agencies during the 2010 fire season and the remainder of the year. This report includes verification statistics for Fire Weather Watches, Red Flag Warnings, and NFDRS zone trend forecasts; the number of spot forecasts issued; the number of IMET dispatches with the number of days out of the office; and detailed information on fire weather teaching assignments and liaison activities.

Weather Synopsis:

Overall, weather conditions during the 2010 fire season could be classified as cool and damp. The season began with much cooler and wetter than normal conditions during the months of May and June, including late season snows in the mountains. Temperatures this two month period average around 2.5 degrees colder than normal with depressed snow levels and significant low elevation rains. July averaged a bit below normal temperature wise with little rain as a result of persistent onshore flow. There were two warm episodes of note in July, one from the 7th-9th where temperatures reached into the 90s and the second from the 24th-26th with highs in the 80s to lower 90s. There were several episodes of lightning, mainly across the Cascades, however fuel conditions were still very moist at this time. Temperatures returned to normal levels overall during the month of August with drier than normal conditions for the month as a whole. This occurred as a result of predominately slightly cooler than normal conditions punctuated by three brief warm spells, on the 4th & 5th, the 13th-17th and the 24th & 25th where temperatures reached the 80s to locally mid 90s from the 13th-17th. The combination of these conditions finally allowed the fuels to reach critical dryness levels across the area. The dry conditions continued into the first part of September, however temperatures became colder than normal once again. A heavy, early season rain event occurred from September 16th through the 19th which pretty much ended the brief western Washington fire season. This event produced low land rains in excess of 2 inches at some locations and significantly more over the mountains. The fuels never recovered from this event as periodic rains continued through October resulting in much wetter than normal conditions for this two month period.

Fire Weather Watch/Red Flag Warning Verification:

Red Flag Warnings are verified using lightning data, RAWS data, upper air data, NFDRS observations, and other local observational networks. Red Flag events in the Seattle fire weather district west of the Cascade crest consist of scattered lightning, strong east winds combined with low relative humidity, or a dry and unstable atmosphere. East of the Cascade crest in Fire Weather Zone 662, Red Flag events consist of scattered lightning, strong westerly winds combined with low relative humidity, or a dry and unstable atmosphere. Watches and warnings for these events are issued when the observed fire danger, as described by the Energy Release Component (ERC), is equal to or above the 90th percentile in the historical distribution of ERC's. The Fuel Dryness Level category for W1 and W2, as described by NWCC Predictive Services, is also considered.

There were 10 Red Flag Warnings (RFWs) and 2 Fire Weather Watches (FWWs) issued for the Seattle fire weather district during the 2010 Fire Season. All RFWs and FWWs were issued from August 15-26,

which represents the short period this season when fuels were dry enough to elevate fire danger adequately.

Other isolated lightning occurrences and significant events falling short of Red Flag criteria were headlined in the Fire Weather Planning Forecast.

Fire Weather Watch for Scattered Thunderstorms	- 3 issued
Fire Weather Watch for Synoptic Conditions	- 0 issued
Average lead-time on Fire Weather Watches	- 20 hours

Red Flag Warnings for Scattered Lightning	- 0 issued - 0 verified - 0 missed events
Red Flag Warnings for Synoptic Conditions	- 10 issued - 9 verified - 0 missed events
All Red Flag Warnings	- 10 issued - 9 verified - 0 missed events
Average lead-time on Red Flag Warnings	- 10 hours

# Of Red Flag Warnings issued = a + c	= 10
# Of Red Flag Warnings that verified = a	= 9
# Of Red Flag Warnings that did not verify = c	= 1
# Of Red Flag events with no warning issued = b	= 0

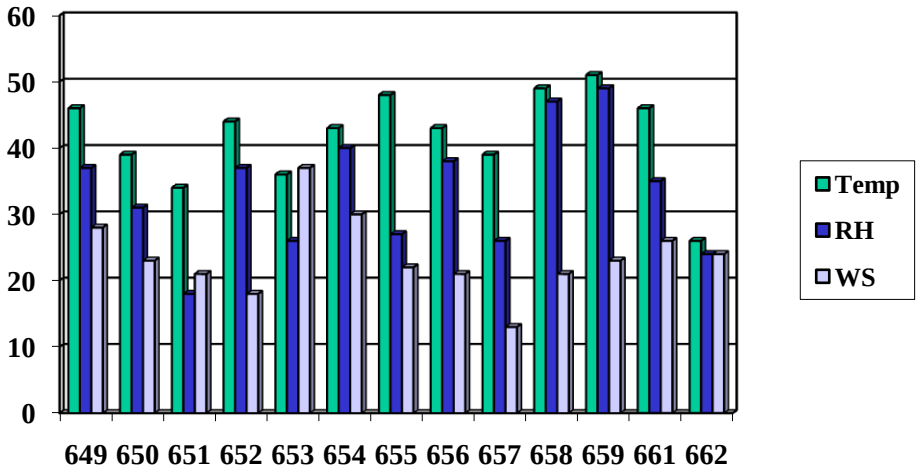
Probability of Detection (POD)	= a/(a+b)	= 9/(9+0)	= 0.90
False Alarm Rate (FAR)	= 1 - (a/(a+c))	= 1 – (9/(9+1)	= 0.10
Critical Success Index (CSI)	= a/(a+b+c)	= 9/(9+1+0)	= 0.90

NFDRS Trend Forecast Verification:

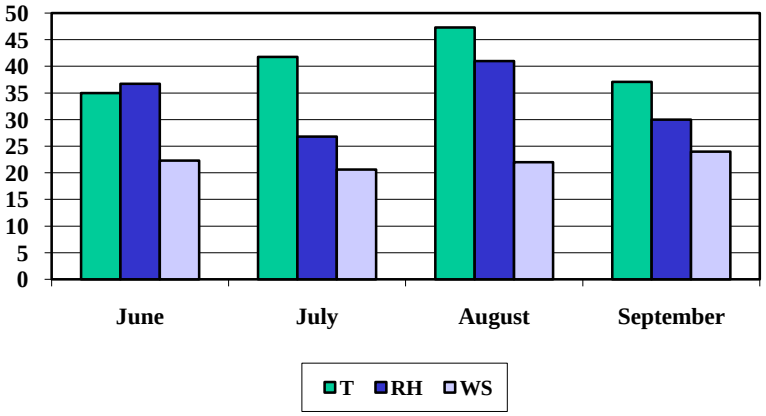
NFDRS Trend Forecast verification was accomplished by comparing the average forecast values derived from the 2 p.m. Zone Tend Forecasts with the 2 p.m. NFDRS Fire Weather Zone observation averages for the following day. While not the most accurate method of verifying NFDRS forecasts, a long-term history has been established using this method dating back to 1984 and provides a consistent way of tracking year-to-year changes in skill. Verification statistics were calculated using the same set or group of stations that were used in previous years.

In 2010 overall, WFO Seattle had its best season of NFDRS forecasting on record. Temperature forecasts beat persistence on average by 41.8%, humidity forecasts beat persistence by 33.4%, and wind speed forecasts beat persistence by 23.5%. The Wind Speed forecasting showed the best performance on record; it was the first time ever where the wind forecast for *every* fire weather zone showed double-digit improvement. The temperature and humidity forecasting each came within 1 percentage point of the record performance from 2009. Overall, we continued a streak of steady forecasting improvements that began in 2004. Climatology-based forecasting recommendations developed at WFO Seattle continued to help with improvements in wind speed forecasting. The narrow range in possible winds speeds, when compared with the possible range in temperature and relative humidity, has traditionally made wind speed forecasting a special challenge in western Washington.

2010 Percent Improvement over Persistence by Fire Weather Zone

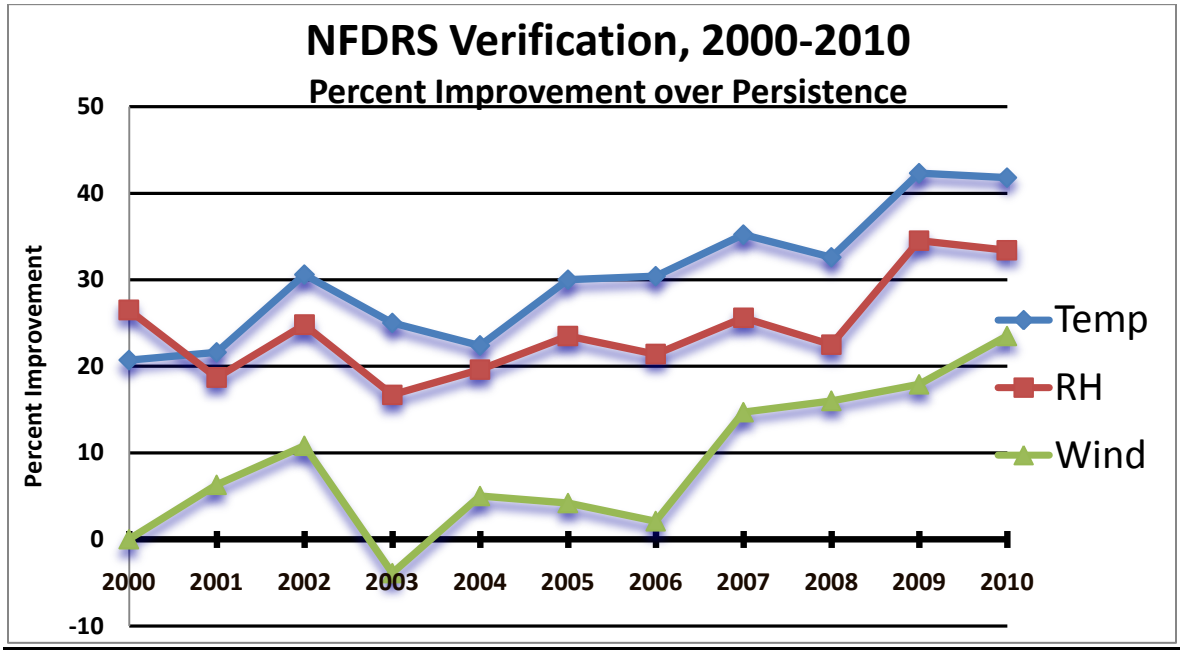


2010 Percent Improvement over Persistence by Month



Yearly Zone Average Verification												
Temperature					Relative Humidity				Wind Speed			
Year		MAE(f)	MAE(p)	%IMPV		MAE(f)	MAE(p)	%IMPV		MAE(f)	MAE(p)	%IMPV
1984		3.7	5.2	28.8		8.8	11.1	20.7		1.8	1.9	5.2
1985		3.2	4.8	33.3		8.6	11.2	23.2		1.7	2.0	15.0
1986		3.6	4.7	23.4		9.0	10.9	17.4		1.6	1.8	11.1
1987		3.4	5.4	37.2		8.0	10.8	25.9		1.5	1.7	8.7
1988		3.2	5.6	42.8		8.2	11.1	26.1		1.7	1.7	11.7
1989		3.2	4.8	33.5		8.5	10.6	19.6		1.5	1.7	12.5
1990		3.3	5.4	37.9		8.5	11.5	25.5		1.4	1.5	4.0
1991		3.3	5.7	52.8		8.2	11.5	28.7		1.6	1.9	15.8
1992		3.2	5.1	38.1		9.0	11.8	23.9		1.5	1.6	3.1
1995		3.3	4.9	32.6		8.8	11.3	22.1		1.7	1.9	10.5
1996		3.0	5.4	44.4		7.8	11.0	29.1		1.8	2.0	10.0
1998		3.4	5.5	38.2		8.1	11.6	30.2		1.6	1.6	0.7

1999		3.8	6.1	37.3		9.0	12.9	30.3		1.5	1.5	0.7
2000		3.6	5.2	30.7		8.6	11.7	26.5		1.6	1.6	0.0
2001		3.5	4.4	21.6		8.1	10.0	18.7		1.6	1.8	6.3
2002		3.4	4.9	30.6		8.0	10.7	24.8		1.7	1.9	10.8
2003		4.1	5.5	25.0		9.2	11.3	16.7		1.9	1.9	-3.9
2004		3.8	4.9	22.4		9.2	11.5	19.6		1.6	1.8	5.0
2005		3.8	5.4	30.0		9.5	12.6	23.5		1.5	1.6	4.2
2006		3.9	5.6	30.4		8.7	11.2	21.4		1.5	1.6	2.1
2007		3.6	5.5	35.2		9.0	12.5	25.6		1.4	1.6	14.7
2008		3.6	5.5	32.6		9.1	12.0	22.5		1.7	2.1	16.0
2009		3.4	6.0	42.3		8.4	13.0	34.5		1.4	1.8	17.9
2010		**3.1**	**5.4**	**41.6**		**7.9**	**12.0**	**33.2**		**1.5**	**2.0**	**23.3**



2010 Spot Forecasts:

Seattle issued 133 spot forecasts during the 2010 season. All requests were made using the Internet spot forecast request form. Each spot forecast was in support of exercises, search and rescue missions, HAZMAT operations, prescribed burns, or wildfire support during the 2010 fire season. By category: 42 were issued for wildland fire support, 65 for prescribed burning support, 14 for Search and Rescue (SAR) support, 3 for HAZMAT/Marine operations and 7 for other exercises.

2010 IMET Dispatches

In 2010, only one dispatch occurred for a total of 18 days of on-site IMET support. This dispatch was to support the Deepwater Horizon Oil Spill in Mobile. No dispatches were in support of wildland fire activities. The table below lists the assignments.

Dates	IMET	Location	Wildfire
7/02-07/19	Cerniglia	Mobile, AL	Deep Water Horizon

Training and Liaison Activities in 2010:

There were a total out of 43 office days spent in 2010 in support of fire weather training and/or liaison activities. The table below lists the assignments. (596 student and veteran Fire Fighters trained, ~2100 other participants at fire weather related outreach/liaison activities)

Date	Forecaster	Location	Activity
3/4/10	**Cerniglia**	**Oak Harbor, WA**	**Spot Forecast Presentation NW Area Committee (47 participants)**
3/22-3/26	**Haner, Cerniglia**	**Boise, ID**	**IMET Workshop**
3/25	**Haner**	**Boise, ID**	**Marine Layer RH Forecasting Talk (~90 attendees)**
4/19-20	**Haner**	**Pasco, WA**	**Seasonal Outlook Talk State Team Mtg. and FBAN Breakout (~200 attendees)**
4/24-25	**Haner**	**Olympia, WA**	**S-290 Instruction (7 students)**
5/5	**Haner, Cerniglia**	**Seattle, WA**	**Fire Wx Users' Mtg. (3 attendees)**
5/11	**Haner**	**Auburn, WA**	**S-290, Unit 6 Instruction Green River Comm. College (12 students)**
5/12	**Cerniglia**	**Port Angeles, WA**	**Fire Refresher (43 students)**
5/13	**Haner, Cerniglia**	**Concrete, WA**	**Fire Refresher Baker River Hotshots (23 students)**
5/19-20	**Haner**	**Cle Elum, WA**	**S-290 Instruction (29 students)**
5/25-26	**Haner, Cerniglia**	**Sedro Woolley, WA**	**S-290 Instruction (15 students)**
5/26	**Haner**	**Olympia, WA**	**DNR/GACC/NWS Mtg. (6 attendees)**
5/28	**Mercer, Buehner**	**Darrington, WA**	**S-190 Instruction (11 students)**
6/8	**Haner, Cerniglia**	**Everett, WA**	**PSICC Wx Refresher (4 attendees)**
6/14	**Cerniglia**	**Enumclaw, WA**	**S-190 Instruction (15 Students)**
6/16	**Haner**	**Port Angeles, WA**	**Fire Refresher (30 students)**
6/16	**Cerniglia**	**Fort Lewis, WA**	**Fire-in-the-Field Exercise (40 Students)**

6/21	**Cerniglia**	**Port Angeles, WA**	**S-190 Instruction (15 students)**
7/1	**Haner, Cerniglia, Buehner**	**Seattle, WA**	**Fire Wx Media Tour**
10/25-26	**Haner, Cerniglia, Cook**	**Spokane, WA**	**Fall NWS/NWCC Mtg. (20 participants)**
10/27	**Haner**	**Everett, WA**	**Spot Forecast Talk Snohomish County SAR (15 attendees)**